Successful Surgical Manipulation of Portacaval Shunt in a Dog

Makoto WASHIZU, Noboru OGI¹⁾, Kunito KOBAYASHI²⁾, Hiromitsu ORIMA, Shuichi KOYAMA, Tsukimi WASHIZU, Takuo ISHIDA, and Shigekatsu MOTOYOSHI

Nippon Veterinary & Zootechnical College, 1-7-1 Kyonan-chou, Musashino 180, and ¹⁾Ogi Animal Hospital, 17-3 Takagichou Suita Osaka, 564, and ²⁾Kobayashi Animal Hospital, 1-5-7, Tukagosi, Warabi, Saitama, 335, Japan
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Several cases of portacaval shunt (PCS) in dogs have been found in Japan, however, complete surgical correction of PCS has not been reported. PCS is a congenital defect of the venovenous fistula which results in liver malfunction [5, 6]. The treatment of dogs with PCS has for the most part been restricted to long-term medical management, which is palliative rather than curative [7]. Surgical correction of PCS has been successfully performed by Breznock [2, 3]. The outcome of earlier surgery varied, probably as a result of portal hypertension caused by complete ligation of the anomalous vessel [4].

This is the first report of a case of successful surgical correction of PCS in Japan. The dog was a 1-year-old female Shih Tzu, weighing 2.4 kg when referred to Nippon Veterinary and Zootechnical College hospital. She was tentatively diagnosed as having PCS on the basis of clinical signs and hematological abnormalities including a high serum ammonia level. Severe neurologic signs such as "hepatic encephalopathy", including depression, seizures and pacing and head-down circling with resultant corneal ulceration were present. Management of neurologic dysfunction by i.v. pentobarbital resulted in prolonged recovery for 5 days before a diagnosis of PCS was made. Abnormal gastrointestinal findings consisted of vomiting, diarrhea, anorexia and foreign body ingestion. Other signs included weight loss, abdominal pain and augmentation of neurologic signs after meals.

Radiographic examination revealed a small liver. Echographic examination demonstrated an atrophic liver with barely recognizable vessels.

Surgery was performed 4 months after dietary control and lactulose administration had been started. The dog was premedicated with 2 mg of morphine, and anesthesia was maintained with halothane. Electrocardiogram and femoral arterial pressure were monitored during the angiographic examination and the surgical procedure.

A median incision was made, and the cranial mesenteric vein was isolated immediately following the induction of anesthesia. A small catheter was inserted to confirm the diagnosis angiographically. The portal angiogram showed a single extrahepatic shunt vessel traversing the liver and draining into the vena cava near the hepatic vein (Fig. 1). The superior mesenteric vein branched to both the shunt vessel and the portal vein. The diameter of the shunt vessel was about three times greater than that of the portal vein. The shunt vessel was isolated and prepared for ligation (Fig. 2). Portal pressure was monitored during ligation of the anomalous shunt vessel in order to avoid severe portal hypertension. Braided silk (3-0) was doubly surrounded to the shunt vessel and partially ligated. The initial portal pressure of 6 mmHg (normal: 8-10 mmHg) rose to 12 mmHg after partial ligation of the shunt vessel (Fig. 3).

Recovery from surgery was excellent, however, mild diarrhea continued for 3 days after surgery and a small amount of ascites was noted upon radiographic examination on day 6.

All clinical signs disappeared after surgery, and a protein rich meal was accepted without producing any abnormalities in the hematologic and biochemical profiles (Table 1). Body weight increased rapidly from a preoperative 2.4 kg to 3.6 kg at the 4 months postoperative evaluation. TP, BUN and cholesterol levels, which were subnormal before the surgery, were within the normal range at postoperative evaluation. Extremely high levels of ammonia were observed without dietary control (preprandial-226 $\mu\text{g/dl}$, and postprandial-500 $\mu\text{g/dl}$). Four months after dietary and lactulose control, pre- and postprandial levels of ammonia were slightly higher than normal. Pre- and postprandial ammonia levels returned to within the normal range after surgery. A high level of serum bile acids (BA) was observed at preoperative examination (preprandial-26 $\mu\text{mol/l}$ and postprandial-40 $\mu\text{mol/l}$). Evaluation of postprandial BA 2 months after

Fig. 1. Lateral radiograph after the injection of 3 ml of contrast material into the cranial mesenteric vein. Complete shunting of blood into the caudal vena cava is shown.

surgery yielded a value $18 \mu\text{mol/l}$. This is still higher than normal, but is acceptable because the anomolous shunt vessel was only partially ligated. Echographic examination of liver structure showed a return to near normal, and the vessels were easier to see at the 4 month postoperative evaluation.

Liver biopsy showed extensive fatty change in the hepatocytes and moderate portal fibrosis. Fibrosis was associated with slight mononuclear cell infiltration and the formation of cholangioles. Vascular changes were limited to the formation of small new vessels in Glisson's capsule and there were no abnormal findings other than congestion.

Treatment of PCS should be handled by surgical ligation of the shunt vessel because

Fig. 2. Schematic drawing of partial ligation of the shunt vessel and portal pressure monitoring.

Fig. 3. Changes in portal pressure during surgical manipulation with the close monitoring of arterial pressure (AP) and ECG. An arrow indicates the final portal pressure (PP) (12 mmHg).

medical management is only a palliative procedure. The success of PCS surgery in this case was due to the close monitoring of portal pressure which should not be allowed to exceed 18 mmHg during shunt vessel manipulation [1].

Table 1. Biochemical findings before and after the surgical manipulation of the portacaval shunt

	Unit	B.W. (a)	ALT (b)	ALP (b)	BUN (c)	Cre. (c)	Chol. (c)	Glu. (c)	Am.pr. ¹⁾ (d)	Am.po. ²⁾ (d)	B.A.pr. ³⁾ (e)	B.A.po. ⁴⁾ (e)
Preoperative period	5m ⁵⁾	1.9	97	144	13	0.5	95					
	4m	1.6	94	114	6	0.6	105		226	500		
	1 d ⁶⁾	2.4	59	225	4	0.3	45	59	134	157	26	40
Postoperative period	1 d	2.4	143	750	6	0.3	74	97	60	118	16	30
	1m	2.6	179	390	6	0.2	194	99	76	91		
	2m	2.9	99	65	12	0.9	142		54	121		
	4m	3.5	225	105	9	0.3	144	98	65		18	

(a) Kg, (b) U/L, (c) mg/dl, (d) $\mu\text{g/dl}$, (e) $\mu\text{mol/l}$.

1) Ammonia preprandial, 2) Ammonia postprandial, 3) Preprandial bile acid, 4) Postprandial bile acid, 5) month, 6) day.

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要 約

犬の門脈体循環シャント (PCS) の外科的処置の成功例 (短報) : 鷺巣 誠・小儀 昇¹⁾・小林紈仁²⁾・織間博光・小山秀一・鷺巣月美・石田卓夫・本好茂一 (日本獣医畜産大学家畜病院, ¹⁾小儀動物病院, ²⁾小林犬猫病院) —— 著明な神経および消化器症状を呈する症例 (1才, 雌, シーズー) に遭遇し, 臨床症状, 血中アンモニア値および胆汁酸値の上昇から PCS と診断した. 門脈圧を測定しながらシャント血管の部分結紮を実施したところ順調な回復を示した.